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Climaite - a three factor climate change ecosystem manipulation study: set up and approaches for data analysis.

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ABSTRACT- In a new Danish climate change related field scale experiment, CLIMAITE, we are investigating the impacts of individual and multiple simultaneous global changes on ecosystem processes and functioning in a Danish semi natural grassland vegetation dominated by *Deschampsia flexuosa* and *Calluna vulgaris*. The Climaite experiment involves three global change factors: elevated CO₂ (510 ppm), elevated temperature (+ 1-2 C) and altered precipitation (1-1.5 months extended drought in May-July) all compared to ambient conditions in a complete factorial design. The experiment includes six replicates of each of the 8 treatments organized as a split-plot design with 12 octagonal plots with a diameter of 6.5m, each divided into four 8.3-m² quadrants. The terrain is heterogeneous because it is hilly and has patches with trees. For improvement of the statistical power the plots have been grouped in pairs (based on vegetation analysis) containing each of the 8 treatments. Prior to initiation of the treatments 3rd October 2005, pre treatment measurements and studies were conducted for establishing the initial status of key variables e.g. soil and air temperature, soil moisture, species composition, the physiological status of plants, soil water chemistry and emission of green house gasses. The CO₂ is enhanced all year around during daylight hours in 6 plots by the use of a FACE system (F. Miglietta design). Temperature elevation is achieved by night time warming where IR reflective curtains automatically cover half of each of the 12 plots 60 cm above the soil surface. Summer drought for 1-1.5 months between May and July will be conducted through water removal by water proof curtains automatically covering half of each of the 12 plots (perpendicular to the IR curtain) during rain events. We here present initial results from the first treatment year on manipulated and ambient CO₂ concentrations and night time temperatures together with plant, soil and ecosystem responses to the treatments (e.g. vegetation surface temperature, soil water content, soil water chemistry, phenology and C sequestration). (www.climaite.dk)

Key words: climate change, related field scale experiment, ecosystem, semi natural grassland vegetation, manipulation, CO₂, temperature and precipitation